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(54) Title of the Invention:  
Telephone System

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### SPECIFICATION (1)

1. Title of the Invention  
Telephone System

2. Scope of Claims

A telephone system which comprises:  
a plurality of telephones each equipped with at least a radio receiver function,  
a portable radio transceiver,  
a private branch exchange (PBX) that interconnects lines among the telephones and is equipped with at least a radio transmitter function,  
and is constructed such that, the portable radio transceiver is registered in said PBX as the destination of a certain telephone, and when said telephone receives an incoming telephone call, said PBX transmits a radio signal to the portable radio transceiver registered for said telephone to indicate that there is an incoming telephone call, and the called portable radio transceiver communicates by radio with another nearby telephone capable of radio communication to enable the incoming telephone call to be routed to said nearby telephone from said PBX.

3. Detailed Description of the Invention

## Summary of the Invention

This is a system that enables telephone calls to be taken at a nearby telephone anywhere within a building. When a portable radio transceiver is called, the portable radio transceiver, by communicating by radio with a nearby telephone, instructs a PBX to connect the calling party to the telephone.

## Background of the Invention

The present invention relates to a telephone system, specifically a telephone system installed inside a building such as an office, a corporate office, a factory or the like, or in a certain area, and equipped with a PBX facility.

In recent years, telephones have been equipped with various kinds of useful functions. One of them is a forwarding system. This is a system in which, if a user leaving their desk enters into the telephone the number of a telephone at the destination, then an incoming telephone call to the desk telephone is automatically forwarded to the destination telephone. However, this telephone forwarding system is conditional on the destination telephone number being registered in advance. Therefore, when the destination is not predetermined, a destination telephone number for automatic forwarding cannot be entered, and it is not possible to utilize this forwarding system.

## Outline of the Invention

The object of the present invention is to provide a telephone system which enables incoming telephone calls to a person's desk to be automatically forwarded to a nearby telephone even when the destination is not predetermined.

The telephone system of the present invention is characterized in that it comprises: a plurality of telephones each equipped with at least a radio receiver facility; a portable radio transceiver; a private branch exchange (PBX) that interconnects lines among the telephones and is equipped with at least a radio transmitter function; and is constructed such that, the portable radio transceiver is registered in the PBX as the destination of a certain telephone, and when the telephone receives an incoming telephone call, the PBX transmits a radio signal to the portable radio transceiver registered for the telephone to indicate that there is an incoming telephone call, and the called portable radio transceiver communicates by radio with another nearby telephone capable of radio communication to enable the incoming telephone call to be routed to the nearby telephone from the PBX.

The above mentioned portable radio transceiver is also assigned a telephone number (identification number). Before the user of the portable transceiver leaves their desk, this telephone number is registered. When the telephone at the user's desk receives an incoming call, the PBX calls the portable transceiver instead of the telephone and this portable transceiver communicates with a nearby telephone. Through this communication procedure, the PBX is directed to call the nearby telephone. Hence the user can respond to the incoming telephone call to their desk by using the nearby telephone. Accordingly, anywhere inside a building or the like,

even when the destination is not predetermined, incoming telephone calls to a user's desk are forwarded to a nearby telephone, which is very convenient. Even when away from one's desk, important telephone calls and urgent telephone calls are certain to be connected, which eliminates the inconvenience of calls not being answered.

### Description of the Embodiment

FIG. 1 shows an outline of the telephone system. A plurality of telephones 3 are linked to a PBX 1 by telephone lines. The telephones 3 are each equipped with a radio transceiver 4. The PBX 1 is equipped with a CPU to perform telephone exchange control and telephone forwarding control and the like, in the memory of which a destination table is held. In the destination table, the destination telephone numbers for forwarding are registered corresponding to the telephone numbers of the telephones that have requested forwarding. The PBX 1 is also equipped with a radio transceiver 2. If necessary, the antennae for this radio transceiver 2 may be set in a plurality of places as required inside the area where this telephone system is installed, especially in the rooms and the like where each telephone 3 is set.

This telephone system uses a card 5 to be carried by a user whose destination is not predetermined. This card 5 has a small radio transceiver built-in. For the transceiver of the card 5, a directional transmitter is desirable. In this case the card 5 is held or set such that the direction can be turned toward a nearby telephone 3. The card 5 is assigned a telephone number like the telephones 3. It is preferable to use a different range of telephone numbers for card 5 from those of telephones 3 so that the PBX 1 can easily identify them. For example, numbers less than 7000 are given to the telephones 3, and numbers not less than 7000 to the card 5. Both the telephones 3 and the card 5 each contain a microprocessor and perform the procedure described later.

FIG. 2a shows the procedure for the telephones, FIG. 2b the procedure for the PBX and FIG. 2c the procedure for the card.

Registration of destination is performed as follows. When a user selects the register destination mode in a telephone 3 and enters a destination telephone number (including the card telephone number), register destination instructions, the telephone number of the telephone used and destination telephone number are transmitted to the PBX 1 through the line (steps 11 and 17 in FIG. 2a). When the PBX 1 receives a register destination instruction from a telephone 3, it stores the destination telephone number corresponding to the telephone number of the telephone that sent the information in the destination table of the memory (steps 31 and 34 in FIG. 2b).

Cancellation of a registered destination is performed in the same manner. When the cancel registered destination mode is selected and the destination telephone number to be cancelled is entered (it is not always necessary to enter this destination telephone number since only one destination is normally set), these data are transmitted to the PBX 1 (steps 12 and 18 in FIG. 2a). When the PBX receives this instruction, it deletes the relevant destination telephone number from the memory (steps 32 and 35 in FIG. 2b).

Connection between a telephone 3 initiating a connection request and a dialed telephone 3, telephone conversation (or communication, data transmission: facsimile and the like) and disconnection are performed as follows.

While not shown in FIG. 2a, when a certain telephone 3 initiates a connection request with a dialed number (the telephone number of the party to be called (the other party)), the PBX 1 proceeds from step 33 to step 36 in FIG. 2b, and checks whether the dialed number (called party) is registered in the destination table. If it is not registered in the destination table, a call signal is transmitted to the called party (steps 41 and 42 in FIG. 2b).

On receiving the call signal, the telephone of the called party rings (steps 14, 21 and 22 in FIG. 2a). When the handset is picked up (YES in step 21), the PBX 1 detects this (YES in step 45 in FIG. 2b) and connects the line between the calling party and the called party (step 46), which enables a telephone conversation and the like between both telephones (step 23 in FIG. 2a). Afterwards, when either the telephone of the calling party or the called party is hung up (handset is replaced), the line is disconnected (steps 24 and 25 in FIG. 2a, steps 47 and 48 in FIG. 2b).

In the case that the telephone of the called party is busy, the PBX 1 transmits a busy signal to the calling party (step 41 and 43 in FIG. 2b) and when the calling party hangs up (YES in step 44), the procedure ends.

In the case that the destination telephone number is registered in the destination table corresponding to the telephone number of the called party, it is checked whether the destination telephone number is for a card 5 (step 37 in FIG. 2b). If the telephone number is not for a card 5 but for a telephone, a calling signal is transmitted to the destination (step 42). Herein, when the destination (called party) answers, communication is possible (steps 45 and 46). This is ordinary telephone forwarding.

In the case that the telephone number registered in the destination table corresponding to the telephone number of the called party is for a card 5 (YES in step 37 in FIG. 2b), a call signal including the telephone number of the card 5 is transmitted from the radio transceiver 2 (step 38).

The transceiver of the card 5, on receiving the radio call signal from the PBX 1 (step 51 in FIG. 2c), transmits a message to a nearby telephone 3 to request the number of the telephone (step 52). When the transceiver 4 of the telephone 3 near to the card 5 receives the radio request (step 13 in FIG. 2a), it sends a reply with its own telephone number to the card 5 (step 19).

When the card 5 receives the telephone number from the nearby telephone 3 (step 58 in FIG. 2c), it informs the PBX 1 of the telephone number received from the nearby telephone 3 through the transceiver (step 54).

When the PBX 1 receives the telephone number message from the card 5 through the transceiver 2 (step 39 in FIG. 2b), it transmits a call signal through the line to the telephone number in the message (the telephone number of the telephone near to the card 5) (step 42). Herein, when the cardholder picks up the handset when the nearby telephone rings (step 45), communication is possible.

Thus, if the telephone number of a card 5 is registered as a destination, when the PBX 1 requests the telephone number of a nearby telephone from the card 5 by radio, the card 5, after requesting the telephone number of the nearby telephone, sends the reply to the PBX 1. Accordingly, the PBX 1 is informed of the telephone number of the telephone 3 near to the card 5, enabling the incoming telephone call to be routed.

In step 39 in FIG. 2b, if a telephone number is not received from the card 5 within a predetermined period after calling the card 5 by radio, it sends a busy signal to the calling party in the same way as in the procedure of steps 41 through 43.

In FIG. 2a, if an instruction other than the ones mentioned above is entered, for example an instruction such as a forwarding instruction to register a dialed number or the like, then an appropriate corresponding procedure is performed (steps 15 and 16).

In the above mentioned embodiment, when a nearby telephone 3 receives a request for its telephone number from a card 5 (step 13 in FIG. 2a), it transmits the telephone number to the card 5 (step 19) and the telephone number of the nearby telephone is sent by radio to the PBX 1 (step 54 in FIG. 2c). However, it is also possible for the telephone to send its telephone number through the line to the PBX 1 and request the PBX 1 to route the incoming call to the telephone itself. When the PBX 1 receives this request, it sends a call signal to the telephone (the telephone near to the card), and the telephone then rings, enabling the cardholder to answer the forwarded telephone call.

Furthermore, in the aforementioned embodiments, the user's radio transceiver is in the form of a card, however, needless to say, it is possible to make it in other forms.

#### 4. Brief Description of the Drawings

FIG. 1 is a block diagram showing the overall outline of the telephone system, and FIG. 2a, FIG. 2b and FIG. 2c are flowcharts showing the procedure for the telephone, the procedure for the PBX and the procedure for the card respectively.

1. Private branch exchange (PBX)
2. Radio transceiver of PBX
3. Telephone
4. Radio transceiver of telephone
5. Card with portable radio transceiver

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#### FIG. 1

- 1 Private branch exchange (PBX), Destination table, Destination TEL No.  
2 Radio transceiver  
4 Transceiver

5 Transceiver, card

FIG. 2 a (Telephone)

Start

- 11 Register destination entered?
- 12 Cancel registered destination entered?
- 13 Radio (card) entered?
- 14 Call?
- 15 Other instruction entered?
- 16 Appropriate procedure
- 17 Register destination, inform PBX of the user's TEL. No. and destination TEL. No.
- 18 Cancel registered destination, inform PBX of the user's TEL. No. and destination TEL. No.
- 19 Transmit TEL. No. to card
- 21 Off-hook?
- 22 Calling ring
- 23 Conversation
- 24 On-hook?
- 25 Conversation complete

FIG 2 b (PBX)

Start

- 31 Register destination?
- 32 Cancel registered destination?
- 33 Call?
- 34 Store TEL No. and destination TEL No. in table
- 35 Delete relevant TEL No. and destination TEL No. from table
- 36 Stored in table?
- 37 Destination TEL No. for card?
- 38 Radio call
- 39 Receive TEL. No.?
- 41 Called party busy?
- 42 Call
- 43 Transmit busy signal
- 44 Calling party on-hook?
- 45 Calling party off-hook?
- 46 Connect line
- 47 On-hook?
- 48 Disconnect

FIG 2c (Card)

Start

- 51 Calling?
- 52 Request TEL. No. of nearby telephone
- 53 Received TEL. No.?
- 54 Transmit TEL. No. to PBX
- 55 End